

---

COMPOSITE FOAM STRUCTURES

RELATED APPLICATIONS

This application claims priority to provisional application No. 60/108,677, filed November 16, 1998.

STATEMENT REGARDING FEDERALLY SPONSORED  
RESEARCH OR DEVELOPMENT

B1  
The U.S. Government has a paid-up license in this invention and the right in limited circumstances to require the patent owner to license others on reasonable terms as provided for by the terms of SBIR Phase II contract No. NAS3-27239 awarded by NASA Glenn Research Center, and Contract No. F33615-01-C-5215 awarded by Air Force.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to the fabrication of composite rigid foam structures, and to the structures so fabricated. In particular, the structures are composed of a rigid foam material that has at least one face sealed or skinned with a thin skin that is tightly and uniformly adhered to but does not significantly penetrate the foam.

Description of the prior art

A cellular solid is made up of an interconnected network of solid struts or plates which form the edges and faces of cells, examples of which are shown in Figure 1. See also, for example, L. J. Gibson and M. F. Ashby, Cellular Solids, Pergamon Press, First Edition 1988.

B1  
Cont

The simplest is a two-dimensional array of polygons, which pack to fill a plane area and are typically called honeycombs. See Fig. 1(a). More commonly, the cells are polyhedra, which pack in three dimensions to fill space. Such three-dimensional cellular materials are called foams. If the solid of which the foam is made is contained in the cell edges only (so that the cells connect through open faces), the foam is said to be open-celled or reticulated. See Fig. 1 (b), and Fig. 2. The cell edges or boundaries of the cell of open-cell or open-pore foams are often called ligaments. If the faces are solid too, so that each cell is sealed off from its neighbors, it is said to be closed-celled. See Fig. 2(c). Foams can

---

## COMPOSITE FOAM STRUCTURES

### RELATED APPLICATIONS

This application claims priority to provisional application No. 60/108,677, filed November 16, 1998.

### STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

The U.S. Government has a paid-up license in this invention and the right in limited circumstances to require the patent owner to license others on reasonable terms as provided for by the terms of SBIR Phase II contract No. NAS3-27239 awarded by NASA Glenn Research Center, and Contract No. F33615-01-C-5215 awarded by Air Force.

### BACKGROUND OF THE INVENTION

#### Field of the invention

This invention relates to the fabrication of composite rigid foam structures, and to the structures so fabricated. In particular, the structures are composed of a rigid foam material that has at least one face sealed or skinned with a thin skin that is tightly and uniformly adhered to but does not significantly penetrate the foam.

#### Description of the prior art

A cellular solid is made up of an interconnected network of solid struts or plates which form the edges and faces of cells, examples of which are shown in Figure 1. See also, for example, L. J. Gibson and

M. F. Ashby, Cellular Solids, Pergamon Press, First Edition 1988.

The simplest is a two-dimensional array of polygons, which pack to fill a plane area and are typically called honeycombs. See Fig. 1(a). More commonly, the cells are polyhedra, which pack in three dimensions to fill space. Such three-dimensional cellular materials are called foams. If the solid of which the foam is made is contained in the cell edges only (so that the cells connect through open faces), the foam is said to be open-celled or reticulated. See Fig. 1 (b), and Fig. 2. The cell edges or boundaries of the cell of open-cell or open-pore foams are often called ligaments. If the faces are solid too, so that each cell is sealed off from its neighbors, it is said to be closed-celled. See Fig. [1] 2(c). Foams can